

\$100 Million Investment in Water Technology by U.S. Department of Energy

Opportunity for State Water Board Partnership

July 24, 2018 – Item 4

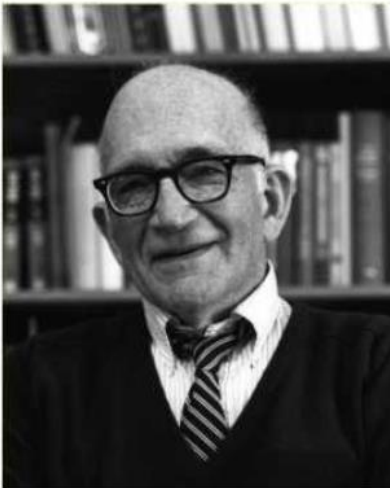


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The first reverse osmosis (RO) membranes were a California invention.

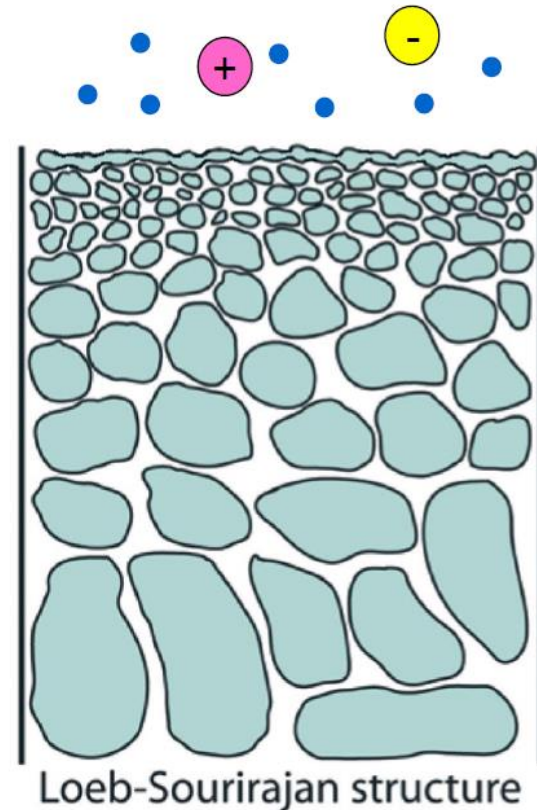
“Anyone who can solve the problems of water will be worthy of two Nobel prizes – one for peace and one for science.” –John F. Kennedy, 1962



Loeb



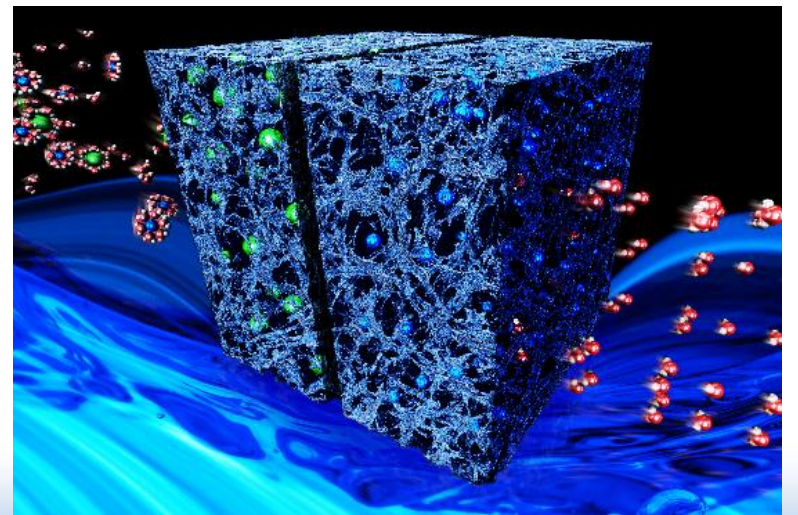
Sourirajan



Loeb-Sourirajan structure

Technology innovation is critical to California and U.S. Water Security.

- With current technology (RO), desalting accounts for >60% of capital and operating costs for managing salinity
- Fundamentally new, low-cost systems are needed to manage nitrates, selenium, ammonia and other salts.
 - **Fit for purpose recycled water**
 - new drinking water
 - industrial cooling
 - agriculture
 - Impaired wells
 - Brackish groundwater



DOE's Advanced Manufacturing Office intends to fund a major clean water research center.

Nov. 2015	Advanced Manufacturing Office (AMO) Workshop on Desalination in San Francisco
Dec. 2015	Office of Management and Budget (OMB) Roundtable on Water Innovation in DC
May 2017	FY17 Budget passed with \$20M for an “Energy-Water Desalination Hub”
June 2017	AMO Request for Information (RFI) on Clean Water Technologies
July/Aug. 2017	AMO Workshops on Clean Water in Dallas, TX and Cleveland, OH
Mar. 2018	FY18 Budget passed with another \$20M for the Energy-Water Desalination Hub
June 2018	DOE Notice of Intent (NOI) to issue Funding Opportunity Announcement (FOA) for an Energy-Water Desalination Hub
July 2018	Anticipated FOA Release

The Energy-Water Desalination Hub will be the largest Federal investment in water treatment research since the Office of Saline Water - 1962



Notice of Intent No. DE-FOA-0001949

Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001905

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Advanced Manufacturing Office (AMO), a Funding Opportunity Announcement (FOA) entitled "Energy-Water Desalination Hub."

This FOA supports the establishment of an Energy Innovation Hub in the area of Energy-Water Desalination (referred to as the "Hub") to accelerate transformational advances in science and engineering focused on reducing the energy and cost requirements of desalination to provide clean and safe water¹. The Hub will include highly collaborative research teams, spanning multiple scientific, engineering, and where appropriate, economic and public policy disciplines.

5-yr, \$100M applied research program designed as a collaboration between the DOE National Labs, academic researchers and industry

DOE Energy Innovation Hubs

“Energy Innovation Hubs are major multidisciplinary, multi-investigator, multi-institutional integrated research centers... The ‘Hubs’ bring together top researchers from academia, industry and the government laboratories with expertise that spans multiple scientific and engineering disciplines... Possibly including non-science areas such as energy policy, economics and market analysis.”

DOE Energy Innovation Hubs include private sector, university and regional stakeholders.

- **Academic, industrial, and government researchers** willing to conceive, design, and evaluate technologies and processes to realize market-driven targets
- **Manufacturers, utilities, municipalities, and policy makers** who will define critical needs and create benchmarks for research targets
- **Institutes and investors** interested in evaluating the most promising technologies and accelerating deployment of the technologies in the market
- **Educators and non-governmental organizations (NGOs)** who will ensure that the sustainable solutions are backed by a well-prepared workforce and embraced by the public

The Notice of Intent identifies four Technical Areas of Interest that impact California's water resources.

- **Materials:** Better membranes, filters and sorbents for desalination; better pipes and pumps for more efficient treatment, conveyance and distribution
- **Processes:** tailored treatments for brackish, recycled and impaired water resources
- **Modeling & Simulation:** Integrate fundamental science & technology knowledge with design and operation of full-scale systems
- **Data & Analysis:** Focus R&D investment and activity on highest impact areas

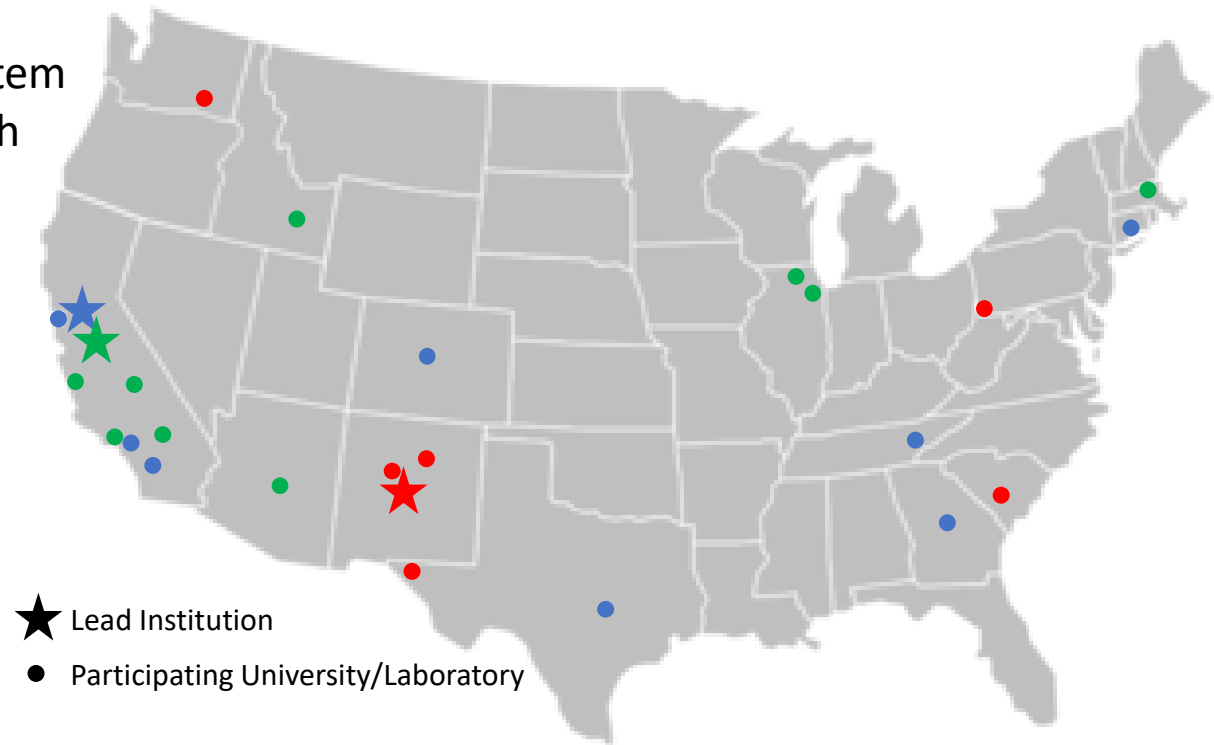
Energy-Water Desalination Hub activities and outcomes help the Water Board to meet its *mission*

- New technologies that “*preserve, enhance and restore California’s water resources and drinking water*”
 - Example: nitrate salt removal from impaired groundwater
- Fit-for-purpose systems that enable “*proper water resource allocation and efficient use*”
 - Example: desalination of recycled water for DPR, IPR and more water-efficient irrigation and industrial cooling
- Technical and economic analysis frameworks that inform policymakers and regulators of the potential for desalination to provide “*abundant clean water for human uses*”
- “*Education and outreach*” platforms:
 - A “*future generation*” of water treatment innovators
 - Unbiased information on diverse water resources for “*all beneficial uses*”

California is home to two teams that are competing for a single Energy-Water Desalination Hub award.

The full innovation ecosystem is well represented on both California-based teams:

- multiple UC Campuses
- water utilities
- manufacturers
- non-profits
- national laboratories



At the same time, nationally competitive teams represent water interests across drought-stricken California, the energy-producing Mountain West, the agricultural heartland and the Nation's urban and industrial centers.

Support from the Water Boards is critical to California's leadership of the Energy-Water Desalination Hub.

Partnership with the Water Boards will ensure development of technology that best addresses California's most pressing water resource challenges.



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